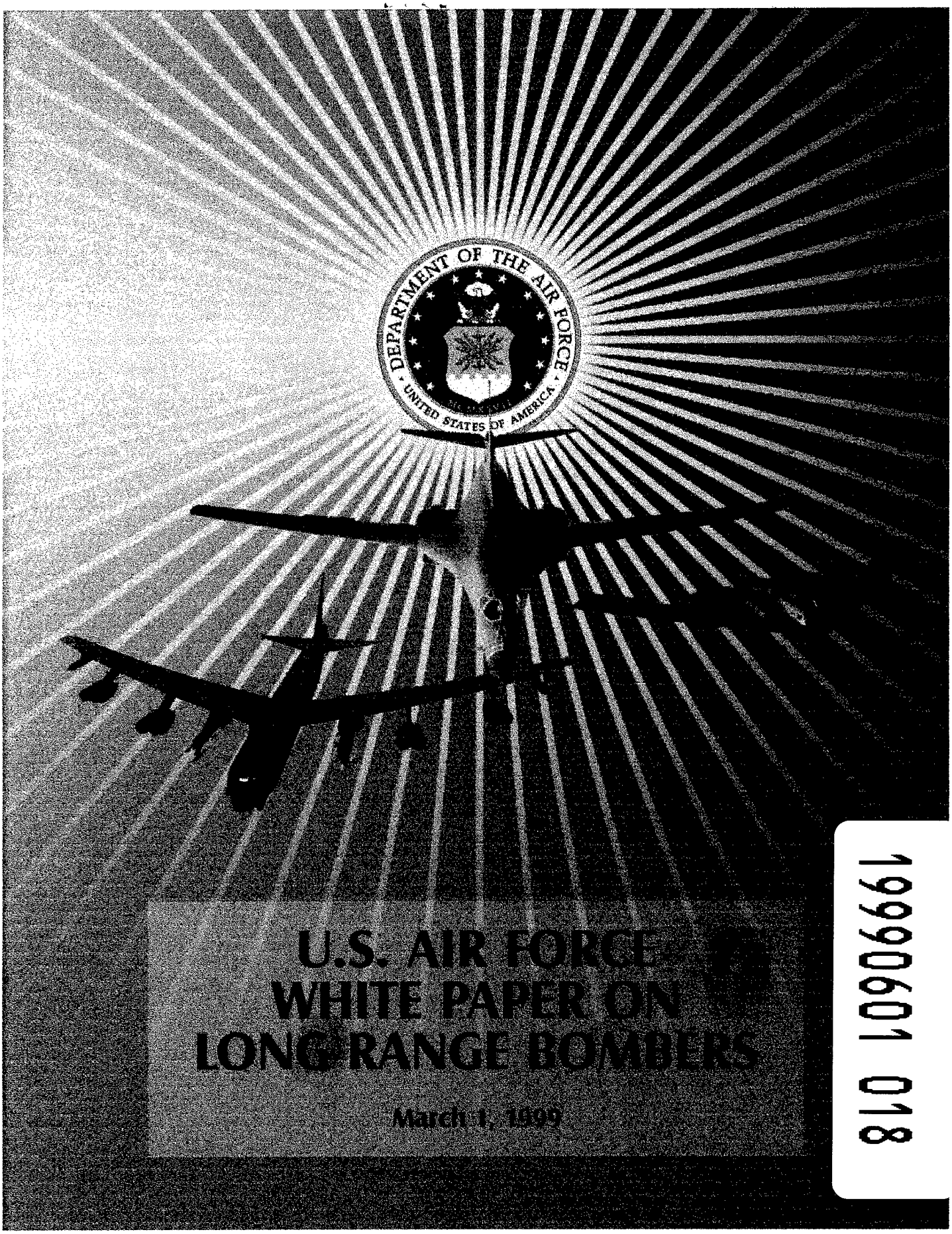


# U.S. AIR FORCE WHITE PAPER ON LONG-RANGE BOMBERS

March 1, 1999

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**CONTENTS**

## GLOSSARY

| | |
|---|---|
| ACC | Air Combat Command |
| ACM | Advanced Cruise Missile |
| AEF | Air Expeditionary Force |
| AGM | Air-to-Ground Munitions |
| AFRC | Air Force Reserve Component |
| ALCM | Air Launched Cruise Missile |
| ANG | Air National Guard |
| AOR | Area of Responsibility |
| ASIP | Aircraft Structural Integrity Program |
| BLOS | Beyond Line of Sight |
| BUR | Bottom Up Review |
| C2 | Command and Control |
| C3 | Command, Control and Communications |
| CALCM | Conventional Air Launched Cruise Missile |
| CAS | Close Air Support |
| CEM | Combined Effects Munitions |
| CINC | Commander-in-Chief |
| CONOPs | Concept of Operations |
| CONUS | Continental United States |
| CUP | Cockpit Upgrade Program |
| DCA | Defensive Counterair |
| DEC | Digital Engine Controller |
| DoD | Department of Defense |
| DT&E | Development Test and Evaluation |
| EA | Electronic Attack |
| EBMM | Enhanced Bomber Mission Management |
| ECM | Electronic Countermeasures |
| ECMI | Electronic Countermeasures Improvement |
| EHF | Extremely High Frequency |
| FOL | Forward Operation Location |
| FY | Fiscal Year |
| GPS | Global Positioning System |
| IOC | Initial Operational Capability |
| ISR | Intelligence, Surveillance, Reconnaissance |
| JASSM | Joint Air-to-Surface Standoff Missile |
| JDAM | Joint Direct Attack Munition |
| JFACC | Joint Force Air Component Commander |
| JSOW | Joint Standoff Weapon |
| QDR | Quadrennial Defense Review |
| LNO | Limited Nuclear Operations |
| LO | Low Observable |
| LOS | Line-of-Sight |
| LRAP | Panel to Review Long-Range Air Power |
| NCA | National Command Authority |
| SA | Situational Awareness |

| | |
|---|---|
| SAR | Synthetic Aperture Radar |
| SEAD | Suppression of Enemy Air Defenses |
| SFW | Sensor Fused Weapon |
| SIOP | Single Integrated Operation Plan |
| TPFDD | Time-Phased Force and Deployment Data |
| WCMD | Wind Corrected Munitions Dispenser |
| WMD | Weapons of Mass Destruction |

# 1. PURPOSE

This paper addresses Congressional language from the Department of Defense Appropriations Bill, 1999 (Report 105-591) and the National Defense Authorization Act For Fiscal Year 1999 (Report 105-532). These reports directed the Department of Defense (DoD) and the Air Force to prepare a comprehensive plan for the future of the long-range bomber force. The plan should identify bomber upgrades with associated funding profiles and include a timeline for consideration of the acquisition of a follow-on platform.

To this end, this document describes the long-range bombers' significance in protecting U.S. national security interests and articulates the Air Force vision of long-range bomber employment in support of national security and military strategy. From this vision emerges an overall concept of operations, both current and evolving, that harnesses the potential of long-range bomber capabilities integrated across the full spectrum of conflict. To ensure the continued viability of the long-range bomber fleet, this roadmap identifies near, mid, and long term modernization priorities with the intent of guiding current and future funding strategies. Finally, a timeline is presented for consideration of the acquisition of a follow-on platform.

## 2. History of Post Cold War Bomber Requirement

### Background

Today's force structure is largely a legacy of the Cold War when intercontinental bombers were part of the Nuclear Triad to deter, and if necessary, defeat the former Soviet Union. While part of the bomber force continues to support the nuclear deterrent mission, the environment permits, in fact demands, increased emphasis on conventional missions. The bomber force structure required to prosecute two nearly simultaneous major theater wars and contribute to a nuclear posture that deters aggression has been defined by studies and national guidance. The 1993 Bottom-Up Review (BUR) confirmed today's bomber force structure requirement. Today's sizing of forces was built on the philosophy that the US should maintain sufficient military power to be able to win two nearly simultaneous, major theater wars. The BUR determined the bomber requirement by 1999 to include up to 184 total bombers (combat coded), with the ability to deliver "smart" conventional munitions against attacking enemy forces and fixed targets.

To support the imperative of engagement in our National Security Strategy, the DoD laid out a National Military Strategy of *Shape, Respond, Prepare Now: A Military Strategy for a New Era.* Details of the strategy and resultant defense program in the May 1997 Report of the Quadrennial Defense Review (QDR), prescribe a total fleet of 187 bombers (95 B-1*, 21 B-2, and 71 B-52). [*Since the QDR, two B-1s have been lost in peacetime accidents.] However, the Report of the Panel to Review Long-Range Air Power (LRAP) concluded the existing bomber fleet cannot be sustained through the expected life of the air frames and that additional aircraft will eventually be required. To address this issue, the Air Force will add five additional B-52 attrition reserve aircraft, bringing the B-52 total from 71 to 76 for a total bomber force of 190.

### Current and Planned Bomber Force Structure

A fleet of 190 bombers is required to support mission taskings through the life of the airframes. From the total number of 190 programmed bombers, 130 will be combat-coded aircraft, 24 are for training, 14 are attrition reserve, 2 are test, 20 are backup. The B-1 will complete its

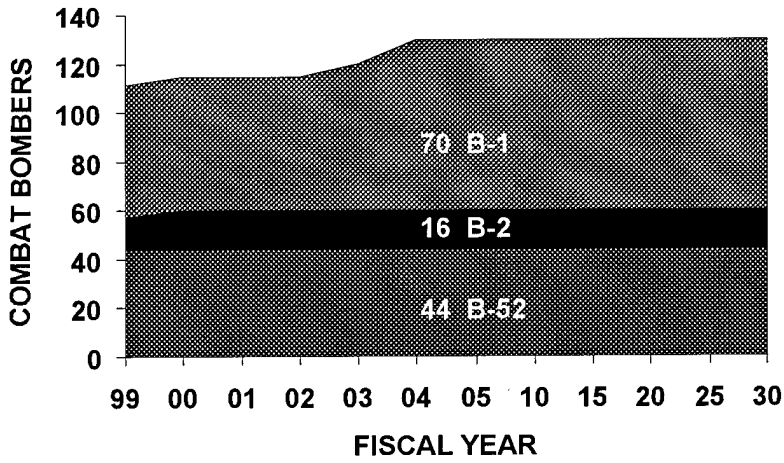



Figure 1. Bomber Combat Coded Force Structure

buy back of attrition reserve by the fourth quarter of FY03, and re-code six training aircraft to attain 70 combat-coded aircraft by the fourth quarter of FY04. The B-2 fleet will have 16 combat-coded aircraft by the second quarter of FY00, and the B-52 fleet will remain the same with 44 combat-coded aircraft. In all, there will be 130 combat-coded bombers by FY04 as shown in Figure 1.

Figure 2 illustrates the planned bomber bed down locations and squadron Primary Aircraft Authorized after all programming actions are completed (FY04). All numbers in Figure 2 represent active, combat-coded (CC) aircraft unless otherwise noted.

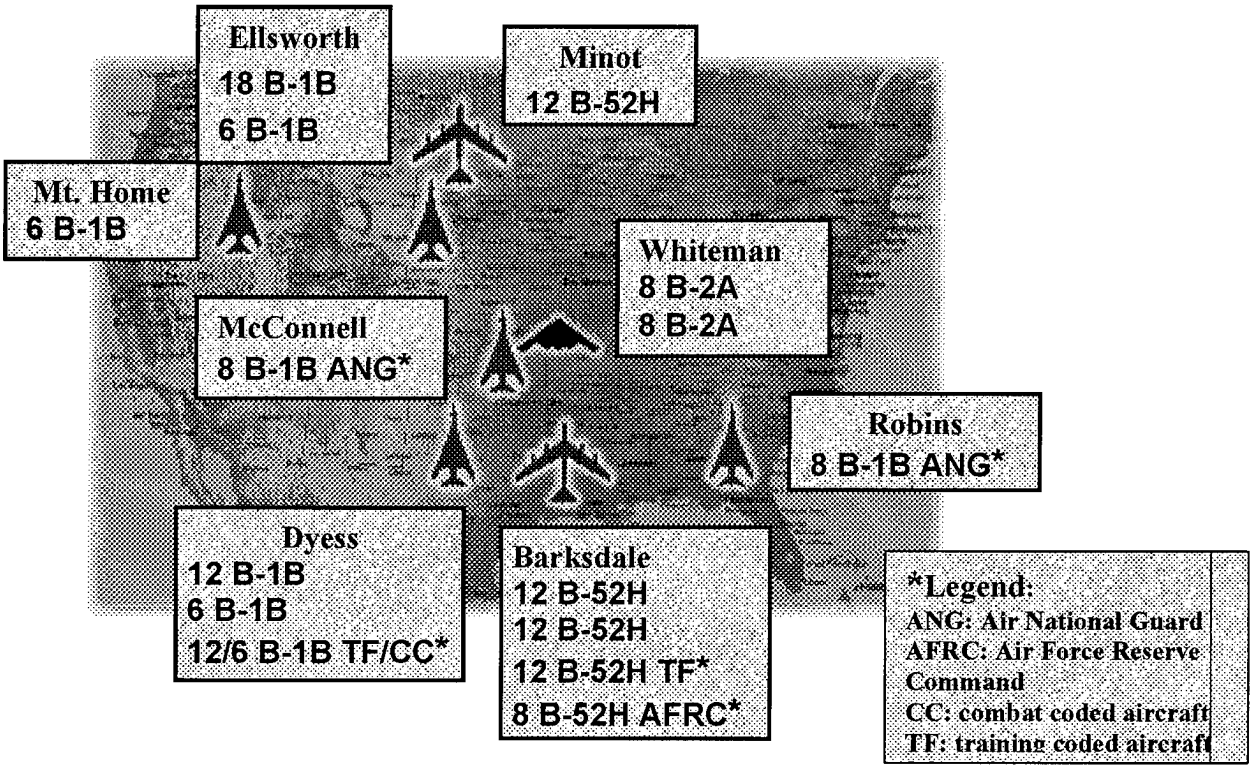
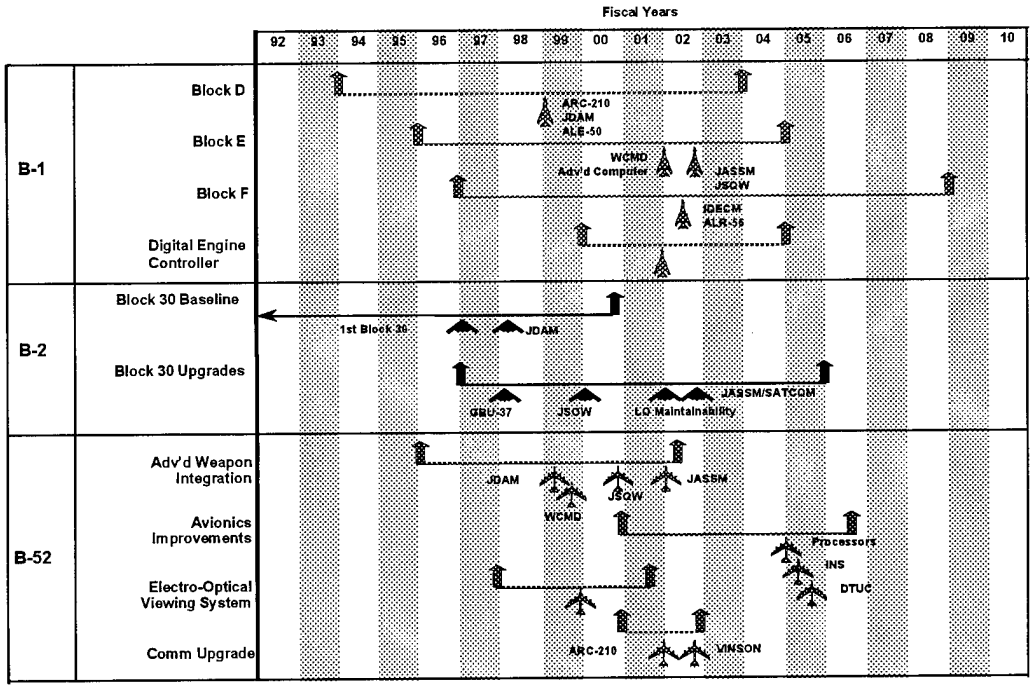



Figure 2. Combat Coded Bomber Locations (Planned)

## 3. CURRENT STATUS OF BOMBERS WITH UPGRADES AND REQUIREMENTS

### Programmed Upgrades

Early in the next century, the bomber fleet will see the fruition of the plans described by the Air Force's '92 Roadmap, including the transition of the bomber force from a cold war instrument to a flexible response force. Figures 3 and 4 show the bomber modernization efforts as of the FY00 President's Budget. The Air Force is committed to bomber modernization. Consistent with the LRAP findings and the Defense Science Board's 1998 Summer Study Task Force Report, we are making significant near through long term investments in integrating precision munitions, enhancing connectivity and mission planning responsiveness, and increasing bomber sortie rates. To this end, the Air Force has already invested $3.6 billion in new combat capabilities and reliability and maintainability upgrades. Additionally we are budgeting for $22.6 million in bomber Forward Operation Location (FOL) requirements. However, the bomber program is budget constrained, like all Air Force programs, and this forces a funding reduction beginning in FY01. This reduction will be reviewed in the FY2001 programming and budgeting cycle.




Arrows = Program Start/Stop Dates Aircraft = Initial Operational Dates (IOC)

Figure 3. Programmed Bomber Upgrades

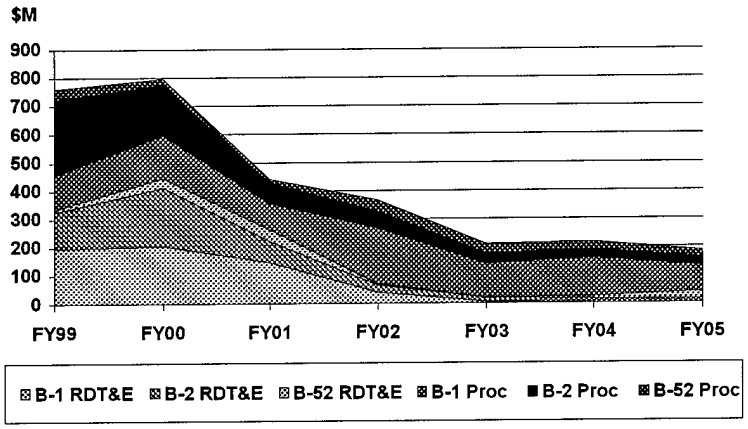



Figure 4. Planned Bomber Funding

## Future Modernization

This section presents future modernization in terms of near, mid, and long term requirements. Near term applies from FY00-10, mid term from FY06-15, and long term beyond FY15. In addition, the section provides a brief summary of each modernization program. Funding streams are applied for the near term programs while the mid and long term initiatives show the total funding required. Costing figures beyond the FYDP are not budget quality.

Future bomber modernization is guided by the Air Force's Core Competencies, the war fighting commanders'operational requirements in the 21st century, shortfalls in capability to support our warfighting doctrine, and combat operations as an integral part of an AEF. To address this vision and CONOPS, bomber modernization will focus on the following:

**Improving Situational Awareness (SA) and Survivability.** Technology and new tactics built around information superiority add a new dimension to SA and survivability. As demonstrated on the B-1 during EFX-98, data links provide in-theater and beyond line-of-sight (BLOS) real-time cockpit information ensuring greater mission success and survivability against the most lethal enemy threats. In addition, improvements to on-board sensors enhance the off-board information; fusing off-board and on-board information provides the crew with a complete battlefield picture that significantly increases lethality and survivability.

**Sustaining Combat Capability by Combating Obsolescence.** The current bomber fleet will be operational for the next 35-40 years. Upgrades to avionics, main processors, radar, displays, and navigation equipment are essential to keep the fleet operationally relevant and affordable.

## Additional Needed Near Term Upgrades

Near term bomber modernization funding needs have been addressed in several sources: FY00 funding in Program Budget Decision (PBD) 753, a directed adjustment by Program Decision Memorandum II (PDM II), 7 Oct 98, and the current Air Force FY00 Unfunded Priority List. Figure 6 depicts current funding for the programs listed in Figure 3, and additional FYDP funding needed for the near term upgrades listed in Table 1. Full program funding for the modernization needs listed in Table 1, require funding across the FYDP above the current Presidents Budget.

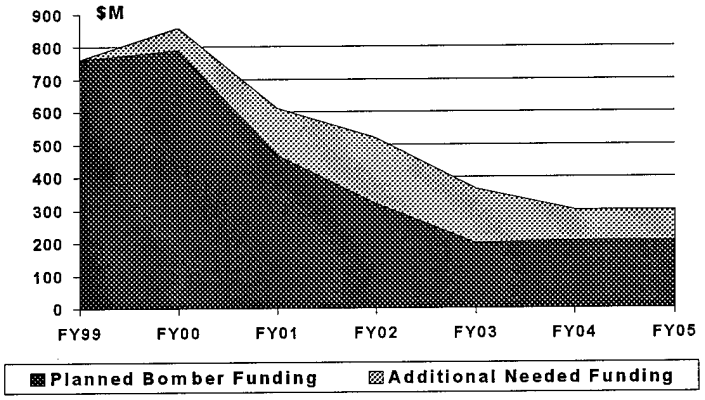



Figure 5. Additional Needed Funding

**B-1/B-2 Link-16** – Providing Line-of-Sight (LOS) data for aircraft-to-aircraft, aircraft-to-C2, and aircraft-to-sensor connectivity, Link-16 is a combat force multiplier that provides U.S. and other allied military services with fully interoperable capabilities and greatly enhances tactical Command, Control, Communication, and Intelligence mission effectiveness. Link-16 provides increased survivability, develops a real-time picture of the theater battlespace, and enables the aircraft to quickly share information on short notice (target changes). In addition to a localized capability, the B-1's datalink will include BLOS capability increasing flexibility essential to attacking time-sensitive targets.

**B-2 Connectivity** – DoD requires survivable communications media for command and control of nuclear forces. To satisfy the requirement, the Air Force plans to deploy an advanced Extremely High Frequency (EHF) satellite communications constellation. This constellation will provide a survivable, high capability communication system. Based on favorable results from a funded risk reduction study, the B-2 will integrate an EHF communication capability satisfying connectivity requirements.

| ADDITIONAL NEEDED NEAR TERM UPGRADES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FY | | | | | | | | | | | |
| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | TOTAL |
| B-1 LINK-16/BLOS | 23* | 28 | 37 | 38 | 21 | 22 | 23 | 14 | 6 | 1 | 1 | 214 |
| B-2 LINK-16 | 36 | 57 | 47 | 27 | 12 | 12 | 12 | --- | --- | --- | --- | 203 |
| B-2 CONNECTIVITY | 3** | 39 | 48 | 47 | 19 | 20 | 19 | 19 | 19 | 3 | 1 | 237 |
| B-52 SA | 6** | 19 | 68 | 52 | 42 | 39 | 31 | 12 | --- | --- | --- | 269 |
| TOTAL | 68 | 143 | 200 | 164 | 94 | 93 | 85 | 45 | 25 | 4 | 2 | 923 |

Note: * Funded in FY00 with $22.7M adjustment from PBD 753.
** Funded in FY00 PB for amount shown per PDM II.

Table 1. Near Term Upgrades

**B-52 Situational Awareness** – SA is the highest priority modification needed for the B-52. The Electronic Countermeasure Improvement is a Reliability and Maintainability initiative that upgrades two low Mean Time Between Failure components, and replaces two Control and Display Units (CDU) with one CDU. The ECM system uses 1960s-era technology and will likely be unsupportable by FY02.

## Desired Mid Term Upgrades

**B-1 Cockpit Upgrade Program (CUP)** - Current B-1 cockpit display units are not capable of supporting graphic intensive software modifications. The CUP installs a robust graphic capability via common display units throughout the front and aft stations. This program increases B-1 survivability by providing critical situational awareness displays, needed for conventional operations, keeping pace with current and future guided munitions integration, enhancing situational awareness, and improving tactical employment.

| DESIRED MID TERM UPGRADES | |
|---|---|
| | FY 06-15 |
| | TOTAL |
| B-1 CUP | 236 |
| B-52 LINK-16 | 221 |
| B-2 DEC | 27 |
| B-52 DATA BUS | 194 |
| TOTAL | 678 |

Table 2. Mid Term Upgrades

**B-52 Link-16** - A line-of-sight datalink that uses structured message formats to provide the capability for an organized network of users to transfer in real-time/near real-time, digitized tactical information between tactical data systems used to increase survivability and develop a real-time picture of the battlespace.

**B-2 Digital Engine Controller** - The current analog engine controllers are high failure items, and without funding, ACC will be forced to ground

aircraft beginning approximately FY08. Replacement of the engine controllers will improve the B-2's performance and increase supportability, reliability, and maintainability.

**B-52 Data Bus in the Bomb Bay** - This upgrade would provide the equipment and programming necessary to put the 1760 interface into the B-52 bomb bay. The aircraft can currently carry "smart" weapons only on external pylons. This enhancement provides internal carriage of smart munitions, increasing carriage of JDAM, JSOW and JASSM to 20 weapons, and WCMD to at least 24, possibly 32.

## Candidate Long Term Upgrades

**B-1 Radar Upgrade** - This upgrade would improve the current Synthetic Aperture Radar resolution from three meters to one foot or better, allowing the B-1 to more autonomously and precisely Find, Fix, Target, Track, Engage, and Assess enemy targets with guided direct-attack or standoff munitions (JDAM/JSOW). Finally, the upgrade would replace older components that will be difficult to maintain due to obsolescence and vanishing vendors.

**B-2 Computers/Processors** - With advances in computer technology and increased demands on the system, the B-2's computers will need to be replaced with state-of-the-art processors. Although reliable, maintaining the present processors will become increasingly difficult and costly.

**B-2 Signature Improvements** - The B-2's signature meets operational requirements against today's threats. As advanced threats proliferate, it will be prudent to investigate advanced signature reduction concepts and determine if it is necessary to improve the B-2's low observable signature.

| CANDIDATE LONG TERM UPGRADES | |
|---|---|
| | BEYOND FY 15 |
| | TOTAL |
| B-1 RADAR UPGRADE | 229 |
| B-2 COMPUTERS | 264 |
| B-2 SIGNATURE | 113 |
| B-52 EBMM | 79 |
| TOTAL | 685 |

Table 3. Long Term Upgrades

**B-52 Enhanced Bomber Mission Management (EBMM)** - B-52 missions demand the flexibility to update or re-plan a mission while enroute to the target. The in-flight attack planner/autorouter will allow flexible on-board re-plan of all mission changes increasing flexibility, lethality, and survivability.

## Fact of Life Upgrade

Global Air Traffic Management (GATM) is a navigation and communication standard mandated by the International Civil Aviation

Organization to accommodate the increased global air traffic predicted for the 2010 time frame. Implementation ensures continued peacetime access to global airspace and may require upgrading bomber communications and navigation capabilities. The Air Force is assessing its bomber operations against the levied GATM requirements and the potential need for upgrades.

**Emerging Technology**

Rapid advances in technology have the potential to significantly increase bomber lethality, survivability and sustainability. Integration of emerging technologies will enable bombers to successfully execute missions in an increasingly lethal and diverse battlespace. As these technologies mature, we will assess their contribution to improving data-fusion, precision weapons capability, and sortie generation.

## 4. VISION: *PGMS ARE THE FUTURE – CURRENT STATUS OF PROGRAMS*

The long-range aerospace power of today's Air Force is a potent force for deterrence of both conventional and nuclear conflict. The significant conventional modernization effort outlined in the 1992 Bomber Roadmap has produced three large payload, long-range "bomber" platforms now able to conventionally destroy multiple targets per sortie - creating desired effects at the strategic, operational, and tactical levels simultaneously. Within the next 12 months, all three bombers will have large payload Joint Direct Attack Munition (JDAM) near-precision delivery capability. The bomber arsenal will also have impressive B-52 stand-off weaponry and Joint Stand-Off Weapon (JSOW) capability on-board the B-2. These enhancements have merged precision, stealth, and stand-off with the payload, range and responsiveness of our bomber arsenal. Bombers are now a critical element of a joint conventional aerospace team with unique capabilities to fulfill Commander-in-Chief (CINC) requirements across the full spectrum of conflict. This conventional conversion is a success story we must continue to build upon.

The vision for "bomber" platforms is a subset of a larger vision for the future of all aerospace forces. As a whole, aerospace forces exist not only to ensure freedom from attack, freedom to maneuver, and freedom to attack, but also to provide the ability to attack or be employed across the spectrum of operational requirements. Aerospace forces mitigate risk to all other forces not only by providing aerospace superiority, but also by providing effective combat power capabilities at minimal risk to friendly forces or personnel. Today's bomber platforms hold unique combat power capabilities and represent an important piece of Air Force core competencies of Global Attack and Precision Engagement. As such, they play a crucial role in fulfilling the aerospace force contributions to theater CINC's across the world and across the spectrum of conflict.

Theater CINC requirements can typically be captured by statements of desired "effects." Some "effects" are more critical in priority, and typically the priority is measured in time. Bomber platforms bring a wide variety of options to fulfill these "time-critical effects" by their unique characteristics of payload, stealth, and stand-off combined with the broader aerospace power characteristics of speed, range, precision, lethality, and freedom of maneuver that all aerospace assets possess. Future bomber modernization will continue to integrate capabilities such as datalinks, smarter and more lethal munitions, and improvements in deployability and sustainability into the bomber fleet. These new capabilities will open a wide array of new bomber roles and missions that capitalize on the bomber's unique attributes and permit the bomber force to actively participate in tomorrow's full-spectrum battlespace.

Finally, our ability to modernize and sustain today's bomber force will eventually reach a practical limit, driving the requirement for a replacement capability. In anticipation of this, we will identify a replacement timeline and

be positioned to field a replacement platform that satisfies future warfighter requirements.

**Current Weapons**

Our bombers are capable of employing the following weapons:

| Munition | Description |
|---|---|
| AGM-86/B Air Launched Cruise Missile | Strategic nuclear cruise missile (B-52 only) |
| AGM-86/C Conventional Air Launched Cruise Missile | 600 mile highly accurate standoff conventional weapon available in finite quantities (B-52 only) |
| AGM-129/A Advanced Cruise Missile | Low observable, strategic nuclear missile (B-52 only) |
| AGM-142 Have Nap | B-52 delivered stand-off precision missile for use against hardened structures (B-52 only) |
| B-61, B-61-11 (B-2 only), and B-83 | Nuclear gravity weapons |
| CBU-87 and CBU-89 | Area cluster munitions for anti-armor and anti-personnel |
| CBU-97 Sensor Fused Weapon (SFW) | Lethal anti-armor, skeet weapon providing multiple kills per pass |
| GBU-31 (JDAM)* | Global Positioning System (GPS) guided weapon used against soft and hardened targets |
| GBU-37 | 4700 lb. GPS guided weapon used by the B-2 against hardened or buried targets. Available in limited numbers. (B-2 only)* |
| MK-62 | Open water or port access sea mine |
| MK-82 and MK-84 | 500 and 2000 lb. general-purpose bombs |

*B-2s employing JDAM and GBU-37 achieve "near-precision" accuracy due to their advanced targeting system.

Table 4. Bomber Munition Description

**Future Weapons**

The JSOW is a 40 mile stand-off weapon that uses GPS to glide to designated coordinates (capability FY00). The JSOW carries various types of dispenser munitions including anti-armor and Combined Effects Munitions. This weapon will be used in attacking or targeting medium to soft area targets and is an excellent self-SEAD weapon. The Joint Air-to-Surface Stand-off Missile (JASSM) is a low signature, GPS guided, powered missile that uses a terminal guidance mode, contains a 1000 lb. warhead, and has a range in excess of 150 miles (capability FY02). The Wind Corrected Munition Dispenser

(WCMD) is an inertially guided CBU canister providing accurate CBU employment from medium to high-altitude (capability FY99). Integration of WCMD is currently programmed for the B-1 and B-52.

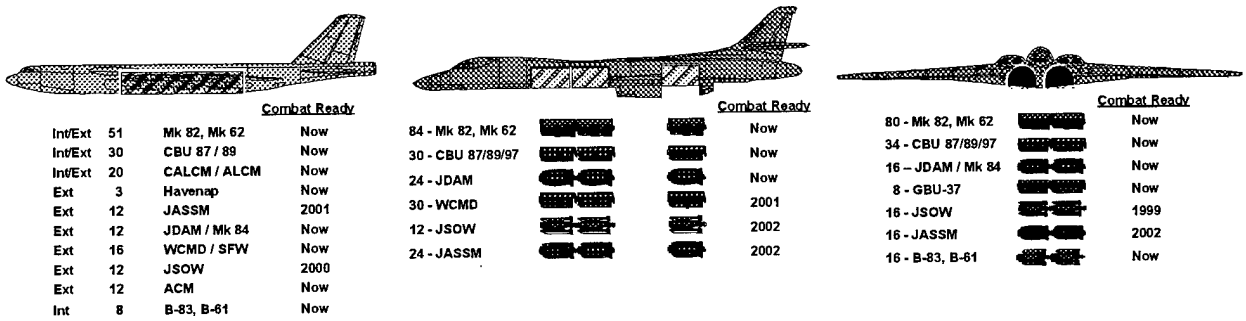



Figure 6. Bomber Loadouts and Munition Capability Dates

## 5. DISCUSSION OF CURRENT AND FUTURE CONOPS

### Bomber Attributes

The bomber's unique strengths of payload, range, and responsiveness coupled with precision attack are a cornerstone of America's airpower and force projection. Prior to hostilities, bombers are a strong deterrent. When generated for either conventional or nuclear alert, bombers provide a strong and highly visible deterrent force just over the horizon from the enemy. During the initial phases of a conflict, bombers launching from the United States with adequate tanker support, can strike time-critical targets and stall the enemy attack anywhere in the world. Delivering a large quantity and vast array of munitions, our bomber force can attack an enemy's Weapons of Mass Destruction (WMD), Command, Control and Communications ($C^3$) nodes, and advancing forces to greatly reduce their effectiveness. The stand-off and stealth penetration capability inherent in our bomber force allows them to operate with minimum numbers of supporting operational assets during this initial phase. Utilizing sustained forward-deployed operations, bombers provide increased firepower while reducing the size of force packages and placing fewer aircrews at risk. Should circumstances require, bombers can also provide rapid global response without the need to deploy into theater before striking.

Major programmed and future improvements continue to enhance lethality, force availability, survivability, versatility and flexibility. Initiatives to reduce the logistical requirements of bomber deployment and enhance bomber maintainability and sortie rates will effectively improve the availability of the force. The shift from unguided bombs to precision munitions produces a tenfold increase in bomber lethality. The B-1 and B-2 have already demonstrated the ability of a single aircraft to destroy multiple individual targets on a single mission using individually targeted JDAM munitions, while the B-52 has accomplished the same feat with Conventional Air Launched Cruise Missiles (CALCM).

### Environment

The environment shapes how we intend to fight and defines the capabilities required for successful employment. National security objectives require the Air Force to maintain the ability to project military power around the globe and provide combat power options from the low-end of the spectrum to the capabilities-restrained, high-end of the spectrum. The vast combination of potential political restraints requires an equally vast menu of flexible aerospace combat power options. The long-range capability provided by bombers could make them the first major US weapon system on the scene in a rapidly developing crisis, particularly in regions where the United States does not routinely maintain forces or have basing rights. This tool of US policy may act to initially halt enemy action and conduct continuous, parallel attacks

against our enemies while creating the conditions for follow-on forces to access the area of responsibility.

In the future, our long-range airpower may initially find itself in environments with limited support packaging and battlespace awareness. In this environment the bomber force may encounter advanced Surface to Air Missiles (SAMs) and fourth generation fighters. Survival requires the ability to data-link fused Intelligence, Surveillance, Reconnaissance (ISR) information to either avoid the threat or use countermeasures or stealth to reduce risk. Weapons effectiveness will depend on the bomber's ability to locate and identify mobile targets, rapidly mission plan and re-program weapons inflight, and employ weapons outside lethal threat envelopes. These capabilities require exploiting offboard sensors (data-fuzed and data-linked to the bombers) and improving bomber radars to identify and track mobile targets.

## Current CONOPS

### Aerospace Functions and the Tie to Missions

The US Air Force and its bomber assets represent a truly global force that protects American interests anywhere on earth. Because of their varied missions, bombers provide unique flexibility and versatility. With the inherent speed of the B-1, stealth of the B-2, stand-off of the B-52, and the large arsenal of all three; today's bombers provide for our national requirements across the spectrum of conflict. As the bomber fleet is upgraded, its roles and missions will become additive. Through the use of mass and maneuver, the bomber force brings a large payload of both precision and non-precision stand-off and direct attack weapons. It provides "quantity," in the traditional sense, and "precision mass" at the decisive point and time like no other US military asset. Bomber payload; flexibility; plus inherent capabilities of stealth, range, and stand-off make bombers multi-mission platforms ready to contribute in any of the Air Force's basic functions of Strategic Attack; Counterair missions including Offensive Counter Air (OCA), and Suppression of Enemy Air Defenses (SEAD); Counterland missions of Interdiction (AI) and Close Air Support (CAS); and Countersea (Joint Maritime Operations).

## Missions

**Strategic Attack** is an offensive air operation that affects the enemy's entire effort rather than just a single action, battle, or campaign. Air Force bombers can carry out strategic attack against multiple high value targets, per sortie, with deep parallel attacks. Target sets include the enemy's centers of gravity including command elements, war production assets, and supporting infrastructure.

**Counterair (OCA)** missions destroy, neutralize, disrupt, or limit enemy air and missile power as close to its source as possible and at the time

and place of our choosing. OCA operations include the suppression of enemy air defenses (SEAD), such as aircraft and surface-to-air missiles, or local defense systems and their supporting C2. Bombers are effective against some elements of the integrated air defense systems (IADS), enemy airfields, etc.

**Counterland (AI, CAS)** involves those operations conducted to attain and maintain a desired degree of superiority over surface operations by the destruction or neutralization of surface forces. Specific traditional functions associated with aerospace counterland operations are interdiction and close air support. Interdiction missions divert, disrupt, delay, or destroy the enemy's surface military potential before it can be used against friendly forces. The bomber's flexibility and large payload allow it to effectively strike transportation, troop staging and concentration points, logistics and other parts of the supporting infrastructure in order to weaken and disrupt the enemy's efforts. CAS consists of missions flown against hostile targets in close proximity to friendly forces. Bombers have effectively been used in the CAS role. However, missions have to be carefully planned to avoid fratricide and loss of the bomber to enemy fire.

**Countersea** operations are conducted to gain control of the maritime environment and to the extent possible, dominate operations in support of friendly naval forces or independently. Countersea functions are an extension of Air Force functions into the maritime environment. Bombers conduct countersea operations by conducting sea surveillance, surface warfare, aerial minelaying, and conducting operations against the enemy navy's shore based facilities.

## Employment Options

### Bombers in the Aerospace Expeditionary Force (AEF)

As the permanent overseas presence of America's military forces decline, we are developing AEFs to provide a flexible, tailored, quick-response force to fill theater needs across the spectrum of conflict. Long-range bombers - with their global range, massive firepower and stealth - integrate with air superiority, support, and other strike aircraft to form a synergistic force that is at the core of a lean, lethal, tailored, and rapidly responsive AEF, as was recently demonstrated in Operation DESERT FOX.

During AEF tasking, bombers can demonstrate their global power capability by launching from the US within hours of initial notification to either forward deploy for presence operations or to strike targets and recover to a FOL for follow-on operations. In addition, bombers offer the warfighting CINCs an option of striking from the Continental United States (CONUS) when theater

access, absence of naval presence, or surprise dictates such a capability. The employment options of bombers directly from the United States are described below with important considerations.

**CONUS – Deploy – Alert at Forward Operating Locations (FOL)**

This option provides CINCs the forward presence of responsive, large payload firepower, and therefore acts as a strong deterrent to adversaries. Should deterrence fail, the heavy payload capability is in position to commence sustained operations with minimal tanker requirements and virtually no impact upon Time-Phased Force and Deployment Data flow. We exercised this option during the Kosovo crisis in October 1998, and February 1999. CENTCOM exercised this option when Iraq failed to comply with United Nations (UN) sanctions in November 1997; and again with B-52s and B-1s prior to operation DESERT FOX. Prior to departing the CONUS, bombers may be configured with the weapons required by the theater planners.

**CONUS – Strike – Forward Operating Location**

This "Employ - Deploy" option permits a rapid initial strike with sustainable operations from the FOL. FOL sorties would be of much shorter duration, thereby minimizing air refueling requirements and allowing more sorties per aircraft. FOL missions also permit extended loiter time in or near the target area. This employment option requires adequate forward basing facilities; petroleum, oil, and lubricants facilities; and pre-positioned equipment/weapons to sustain combat operations and minimize airlift requirements. By FY02, four bases (Andersen AFB, Guam; Diego Garcia; plus a European Command (EUCOM) and Central Command (CENTCOM) in theater base) configured with pre-positioned support equipment and advanced munitions will serve as FOLs for bombers. It will be possible to conduct sustained bomber operations from these FOLs for 7 days and up to 30 days or longer with replenishments. These four bases serve only as baseline options and do not preclude deployments to other locations.

**CONUS – Strike – CONUS**

Bombers can launch from home base, strike assigned targets, and then return to the United States for reload and re-strike. Bombers routinely exercise this capability using sorties to demonstrate US global reach to allies and potential adversaries. Several factors must be considered and thoroughly planned prior to CONUS round-robin strike missions. a). Air refueling coordination and locations are critical. b). Crew force manning and long duration flight training are essential to support 30-45 hour missions. c). Mission duration and complexities

impact mission planning timelines. d). Package support requirements are dictated by the threat. Support (SEAD), Electronic Attack (EA), or fighter coverage may consist of Navy or host nation assets and requires additional coordination. e). Lastly, updated en-route target and threat information are essential. Enroute to distant targets, key elements of the attack may change. Timely updates from access to C2 and ISR networks are critical.

### Nuclear Operations

Bombers performing nuclear missions support the Single Integrated Operational Plan (SIOP) and Limited Nuclear Options (LNOs). For SIOP mission taskings, all tasked B-2s and B-52s will generate to full alert status within required timelines. Once generated, bombers will conduct continuous alert operations to deter escalation or can be executed at the direction of the National Command Authorities (NCA) should deterrence fail. SIOP missions usually strike fixed, high-value targets. Some strategic forces will be held in reserve, allowing the NCA the capacity to continue to deny enemy war aims, influence other nations, and exert leverage for war termination. LNO missions are planned against targets such as hostile weapons delivery systems, troop concentrations, and forward staging areas that are selected at the theater or NCA level. Command and Control of nuclear-tasked bombers is critical.

## Individual Capabilities of Platforms

### Employment Considerations

Bombers can be utilized in stand-off and direct attack force packages. Stand-off packages employ munitions, like CALCM, JSOW, and the JASSM which provide standoff capability outside enemy point air defenses, to increase bomber survivability. Direct attack packages employ JDAM and CBU munitions. Use of electronic situational awareness (SA) and Electronic Countermeasures (ECM), tactics, and stealth technology aid penetration for both standoff and direct attack packages. Planned delivery tactics include low- to high-altitude penetration in single and multiple ship integrated fighting packages.

### B-1 Mission Capabilities

With its speed and maneuverability, the B-1 can penetrate low- to medium-risk threat areas and easily integrate into composite force packages. With three weapons bays, the B-1 is capable of mixed weapons loads, providing multiple target coverage from the same delivery platform. The B-1's performance is optimized for low-altitude, high-speed flight using a mode that

permits automatic terrain-following flight, making all weather, night intrusions into enemy territory possible if the situation demands low-altitude penetration. As a result of the Nuclear Posture Review, B-1s are no longer tasked to perform nuclear missions.

The B-1 operates in the high subsonic or supersonic speeds from 200 feet (terrain following) to mid-30,000 feet range.

**B-2 Mission Capabilities**

The B-2 employs low observable (LO) technology to penetrate medium to high threat enemy air defenses, holding high value targets deep inside an adversary's territory at risk. B-2 LO capability enables warfighting CINCs to task the B-2 to attack high value targets early in the campaign to destroy and disrupt enemy air defense and C2 networks and assist in halting enemy forces.

The B-2 operates in the high subsonic region at altitudes varying from 200 feet (terrain following) up to 50,000 feet to employ all weather GPS guided weaponry.

**B-52 Mission Capabilities**

The B-52H aircraft continues to fulfill the primary role of a conventional and nuclear standoff weapons carrier, with a secondary mission of delivering firepower in a low threat environment. The B-52 carries the most diverse payload of all the bombers.

Situational awareness upgrades will allow the B-52 to continue to employ long-range cruise missiles outside threat ranges, and permit employment of shorter-range missiles and direct attack munitions in air superiority/supremacy environments. Adequate situational awareness will be maintained via upgrade of critical navigation systems and onboard sensors and through incorporation of information from offboard sources.

The evolution toward stand-off employment de-emphasizes aggressive terrain avoidance training requirements and provides opportunities to shift B-52 training.

**Evolving CONOPS: *Implications of future CONOPS for bomber upgrades beyond FYDP***

Evolving bomber CONOPS must capitalize on the new capabilities and technologies available to the force. Combining accurate standoff weapons (JSOW and JASSM), large payloads of precision/near-precision weapons, data-linked ISR (Link-16), and improved avionics/countermeasures will improve the way bombers perform current missions and create new ones.

These new capabilities will lower the requirements for some bomber force packages and produce far greater benefits for those packages with large near-precision weapons payload. The addition of stand-off weapons, combined with

greatly increased SA provided by a robust data-linked network, will provide selective self-SEAD capability for the bomber force. The addition of large payloads of JDAM and SFW greatly enhances the cost-benefit ratio for force packaging penetrating bomber employment formations. This allows capability to destroy multiple targets per sortie, reducing the number of required strike aircraft and packages to achieve desired effects. These new capabilities will either reduce or enhance the payback for all DCA, SEAD, and EA support used in bomber force packaging. This allows the Joint Forces Air Component Commander (JFACC) to accelerate the pace of the campaign and to maximize the offensive potential of available aerospace force assets.

**Time-Critical Effects**

Theater CINCs desire to produce "time-critical effects" across the spectrum. The ongoing weapon modernization combined with bomber payload, range, stealth, and stand-off make these platforms uniquely capable to fulfill a wide variety of CINC requirements. Whether it is countering a potential WMD threat or severing critical Lines of Communication (LOCs) to slow an enemy's mobility rate, the time-critical effects desired can be achieved largely through aerospace power and specifically through bomber platforms.

Creating these effects would increase the bomber's role in theater missile defense, counterproliferation, special operations/terrorism, and close air support. Likewise, precision munitions and the increased ability to effect time-critical targets would now make the bombers more viable in the low end of the spectrum of conflict.

Overall, the bombers of the future will play a greater role in achieving the time-critical effects for the JFACC. A key point is the synergy new bomber capabilities create with other aerospace platforms which minimize support asset requirements and maximize the offensive punch during an air campaign.

## 6. BOMBER LONGEVITY/REPLACEMENT TIMELINE

This section examines the projected useful life of the bomber fleet and suggests a replacement plan. The attrition factors used are the forecast peacetime economic service life and the projected mishap rate.

### B-1 Service Life

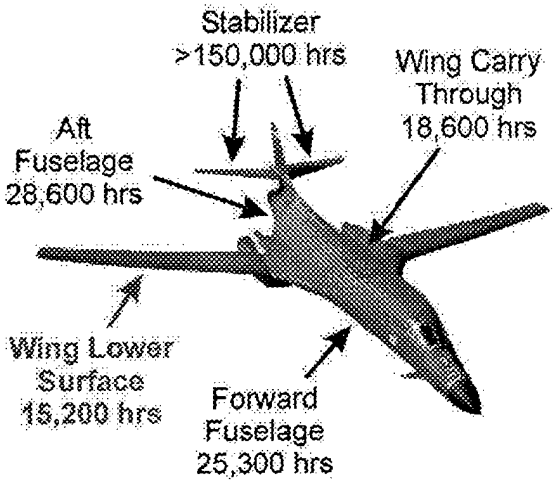



Figure 7. B-1 Economic Service Life

The basis for the projection of useful life of the B-1 and B-52 is the Aircraft Structural Integrity Program (ASIP). The useful life of the structure is assumed to be the point at which it is more economical to replace the aircraft than to continue structural modifications and repairs necessary to perform the mission.

The limiting factor for B-1's service life is the wing lower surface (Figure 7). At 15,200 hours, based on continued low level usage, the wing's lower skin will need replacement. Current usage rates, operational procedures, and mishap attrition will place the inventory below the requirement of 89 aircraft in 2018, while the service life attrition will impact around 2038. (Figure 10.)

### B-2 Service Life

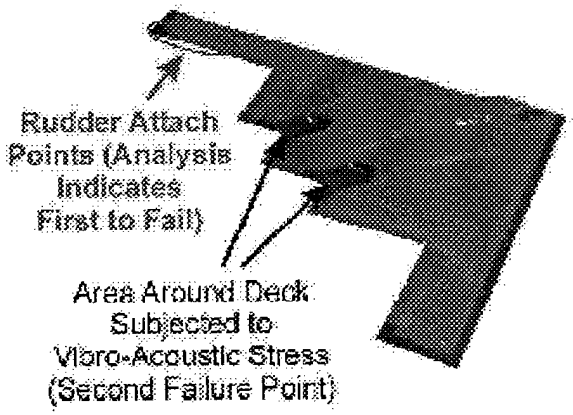



Figure 8. B-2 Economic Service Life

The basis for the useful life of the B-2 includes data from initial Developmental Test and Evaluation analysis. Data indicates the aircraft should be structurally sound to approximately 40,000 flight hours using current mission profiles. Analysis further suggests that the rudder attachment points are the first structural failure item (Figure 8). The B-2 has not implemented an ASIP similar to the other bombers, and this makes it difficult to predict the economic service life and attrition rate. However, a notional projection, based on the B-52, predicts one aircraft will be lost each 10 years. This attrition rate, plus attrition due to service life, will erode the B-2 force below its requirement of 19 aircraft by 2027. (Figure 10.)

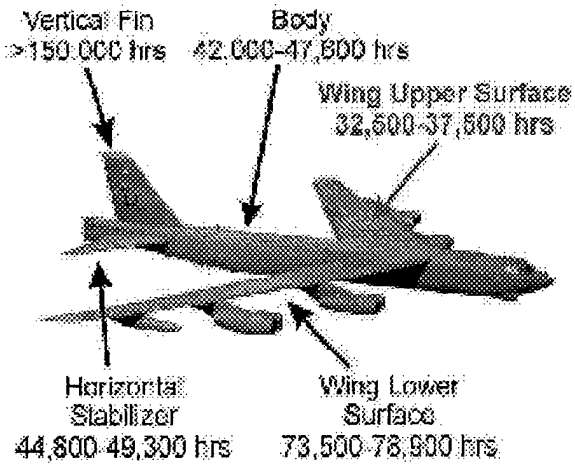



Figure 9. B-52 Economic Service Life

## B-52 Service Life

Figure 9 depicts when the B-52 structure will start to experience wide spread fatigue cracking, requiring replacement of those components. The limiting factor of the B-52's service life is the economic limit of the aircraft's upper wing surface, calculated to be approximately 32,500 to 37,500 flight hours. Based on the projected economic service life and forecast mishap rates, we will be unable to maintain our requirement of 62 aircraft by 2044, after 84 years in service (Figure 10).

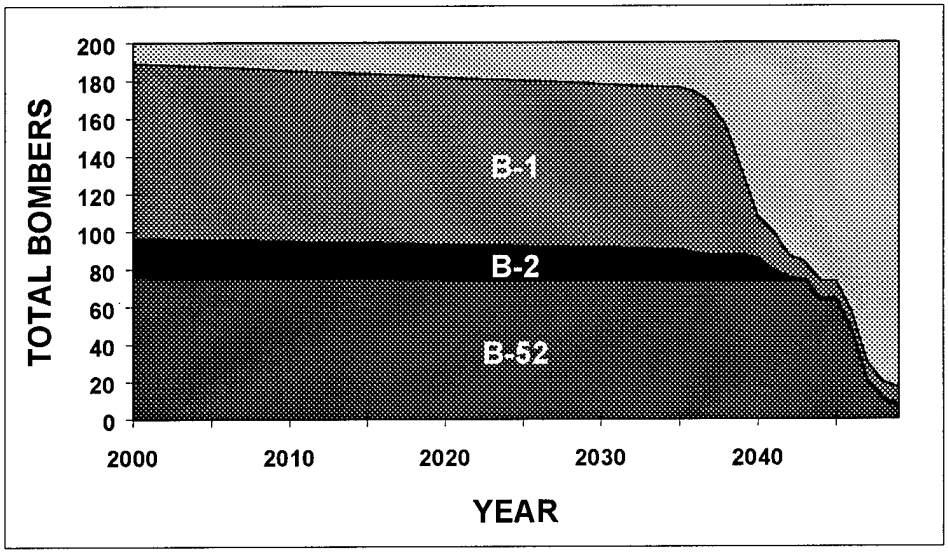



Figure 10. Bomber Economic Service Life and Attrition

## Replacement Timeline

The combined inventory of all three bombers and the requirement to support 130 combat-coded bombers is shown in Figure 11. Based on current operating procedures, attrition models, and service lives, the total bomber inventory is predicted to fall below the required 170 aircraft fleet by 2037. This date will become the target Initial Operational Capability (IOC) date for a follow-on to the current bomber capability, and an acquisition process can be planned by backing up from this date.

Based on current projections for airframe economic service life and forecast mishap rate, initiating a replacement process no later than 2013 will ensure a capability to fill the long-range air power requirement as the current systems are retired. There are, however, additional concerns besides service life and mishap rates that could shift this replacement timeline.

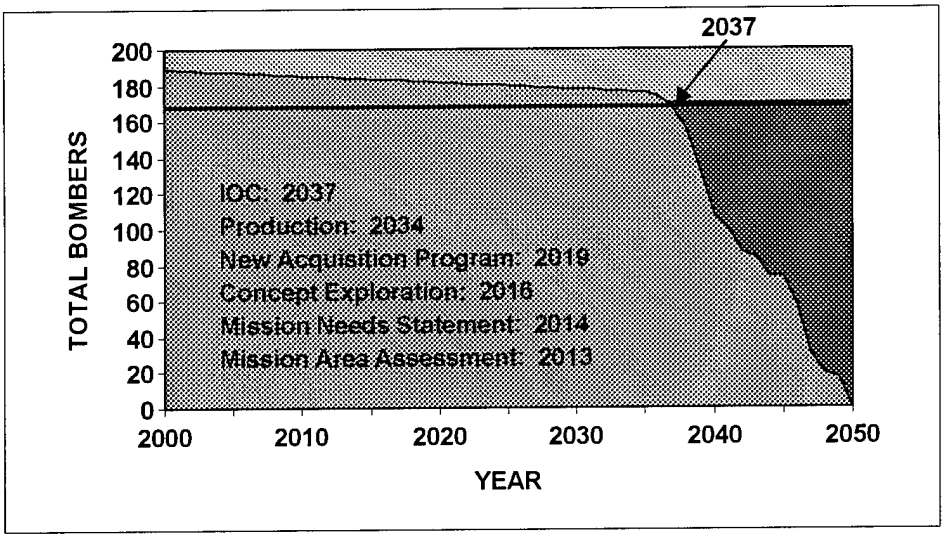



Figure 11. Bomber Attrition and Replacement Timeline

**Pressures on the Replacement Timeline:** ***Implications of future CONOPS for service life and service life extension***

Changes in employment concepts, driven by technological advances in munitions and threats, or improvements in industry's ability to perform cost effective major structural extensions could extend the today's bomber force well beyond current projections. This may shift the acquisition timeline for a replacement capability further into the future.

Conversely, several factors could require acceleration of the bomber replacement timetable in Figure 11. Some of the most likely factors follow:

**Future Threats** – Significant developments in counter-stealth technologies, directed energy weapons or proliferation of and advances in surface-to-air missiles and fifth generation fighters could force radical changes in the use of our current forces and have the potential to render much of it obsolete.

**Conflict** – Any conflict occurring prior to the retirement of the current bomber aircraft could result in a force structure reduction due to combat attrition.

**Unforeseen Increases in Sustainment Costs** – These can occur from a variety of sources, including parts obsolescence or diminishing manufacturing sources for parts and systems unique to the platforms.

**START III Concerns** – Although the final content and ratification of START III is far from complete, it will be necessary to assess both nuclear and

conventional force structure capabilities as a result of future arms control agreements.

The uncertainties outlined above may drive an earlier fielding date for a replacement capability. Consequently, we must be prepared to adapt the replacement process to reflect accelerations to the timeline.

**Next Generation Global Attack Capability**: ***Implications of service life and future CONOPS for new aircraft, Unmanned Aerial Vehicle, missile, or space platform***

If we are able to modernize our bombers, the current fleet should remain a viable force for more than 25 years. However, as discussed earlier, service life, economic considerations, attrition, and mishaps will eventually require us to field a replacement capability. We say "capability" rather than "bomber" since technological advances may lead us to a configuration or platform that in no way resembles today's bomber aircraft. The Air Force is studying enabling technologies for the next generation global attack capability. These studies (with industry, laboratory and acquisition personnel involvement) will determine the highest "pay-off" technologies. The main focus is to combine the best attributes of the existing force (large payload, long range, responsiveness and survivability) and apply the next level of cost effective technological advances to produce a long-range, rapid response, global attack platform.

The Air-to-Surface Technical Planning Integrated Product Team, made up of members from Air Force labs, industry, and the acquisition community, is addressing this gap for bomber replacement. The future holds an aging bomber force, requiring investigation of an affordable deep strike capability. Additionally, an ACC funded Future Strike Aircraft (FSA) study is a one-year effort assessing a medium to long-range platform. The study, due in the summer 99, will investigate possible concepts for the next generation future strike aircraft. There is no question about the need for a future capability for rapid global attack beyond the upgrades to our current bomber force.

## 7. SUMMARY

Long-range bombers are integral components of the Air Force's Global Engagement vision. They encompass combat capabilities that impact the full spectrum of conflict. When necessary, long-range bombers can deter aggression and escalation and rapidly project lethal, precise, and massed firepower anywhere on the globe. Timely integration, concentration, employment, and sustainment of long-range air power are important ingredients of U.S. military capabilities. The Air Force long-range plan for bombers will guide the bomber fleet as they remain a key component of our AEFs and a viable tool for the Joint Force Component Commander.

It is likely the current bomber fleet will continue to provide these capabilities for the next 35 years. In order to maintain the bombers as viable weapon systems, we must sustain the current force by improving maintainability, upgrading systems for survivability and connectivity, and improving deployability.

Finally, the Air Force must plan to replace the large payload, long range, and rapid response characteristics inherent in the current bomber force. Although the economic service life and mishap rates indicate a replacement timeline beginning in 2013, future pressures on the timeline may cause a change to this date. The replacement platform must preserve the long-range bomber fleet capabilities and enable us to dominate our opponents across the range of military operations--providing full spectrum dominance into the 21st century.